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VOICE MAIL SYSTEM AND METHOD

FIELD OF THE INVENTION

The invention relates to communication systems and, more specifically, to a system and method for providing voice mail services.

BACKGROUND OF THE INVENTION

The Problem

GSM (and other Cellular based technologies) operators around the world have built an international "network of networks". However, there is still a need to provide customers with a suite of international enhanced services, one which provides a higher level of services than just the ability to make and receive premium priced mobile phone calls while travelling.

Retrieving VoiceMail messages today

Many factors influence VoiceMail usage. However, the main factors are the *ease of use* (how simple it is to deposit and retrieve messages) and the relatively low cost of retrieving messages. In order to simplify the retrieval process, many operators offer their subscribers a "short code" number, which allows direct retrieval of voice messages without any further action. The case is different when a subscriber roams. In order to retrieve his messages, the subscriber typically must call his network, using a full international number (14 digits when calling direct, and 35 digits when using "call back" services). The subscriber then has to key in his mail box number and password (an additional 4 to 10 digits).

Due to the complexity this procedure, the chances of completing this procedure correctly are low. The chances that the subscriber will not try again after failing the first time are also low. More importantly, after this lengthy and often frustrating process, the subscriber is required to pay high international rates. For this reason, many corporations do not allow their employees to retrieve messages when roaming.

SUMMARY OF THE INVENTION

The concept of invention

The invention provides VoiceMail (and other enhanced) services to roaming subscribers. A system constructed according to the invention provides services that cross different cellular standards (GSM, TDMA, etc.) and provides ubiquitous global access to enhanced services.

In a preferred embodiment, the invention enables retrieval of Voicemail by a remote access method. This method enables remote access by the user to his home site using a communication infrastructure. For example, this method may provide cost-effective communication by streaming the message over the IP backbone.

In another embodiment, the invention enables retrieval of Voicemail by transferring the voicemail messages to the remote site (for example, using file transfer methods). It may also be possible to use a combination of these two methods.

DESCRIPTION OF THE INVENTION

The Global Network Description

Referring to Picture 1, the Global network is a combination of Service Nodes connected to each mobile network using digital telephony interfaces, and an IP network connecting all the Service Node Platforms. In the corporate environment, a "CPE GW" may be used as a low cost implementation of a public service node.

Applications and Services Description

Brief Description of the services

- Global Voicemail notification - Roaming mobile user gets a special short message to indicate that he has new voice mail. The short message indicates the short code that the user should dial in order to access his home voice mail system. The service covers both the public voicemail systems connected to the mobile (or fixed line) network, and the corporate voice mail of the same user.
- Short Code Dial to voicemail - Roaming mobile user retrieves his voicemail. The system automatically identifies the user's home address based on his PERSONAL CLI (CLI related to the current mobile phone that the user uses) and handy password. The home network ID is determined by the user (PIN based Login), in case that CLI is not available in the roaming network. In addition, the user is able to retrieve his corporate PBX VOICEMAIL messages using the same method.
- Short Code Dial to Callback service – the user can dial a special short code that connects him to a Callback Service Center (like AT&T, etc.).

The user PIN or CLI is used to automatically identify the user, and prevent the need to enter a long user ID and password for every new call.

- Call Return – The "call return" enables users to have an easy and cost effective way to return a call to someone that left them a voicemail message. While listening to his voicemail messages, a user can call another party that left him a voicemail message, in order to return the call. The "call return" is done by a one key dial (like "7") that commands the voicemail system to dial back to the other party based on his CLI number stored with the voicemail message.
- IP/TEL based roaming calls - the system can easily be upgraded to support IP/TEL full duplex telephony calls for mobile roaming subscribers. The SN technology will technically support it, and the provisioning for this service will be done by the application and by controlling the allocated IP bandwidth for each voice channel.
- Calling from a wireline telephone – The network also supports operation of the above services from a wireline telephone. In this case, since the CLI is neither "personal" nor available, the subscriber is required to enter a PIN.
- Calling from another cellular phone – In this case the cellular phone CLI is not the personal CLI. The service can be obtained like in the wireline phone case. A preferred solution, however, involves registering the CLI of cellular phone in use as a temporary personal CLI.

Global notification - Application Call Flow

The following description relates, in part, to Picture 2.

- **User gets new voice mail message** - The new voice mail triggers the home VOICEMAIL to send SHORT MESSAGE to the user. The message is sent from the VOICEMAIL to the local SHORT MESSAGE Center. The SN is tapping all the traffic via its SS7 SL connected to the Mobile Network. Alternatively, the network diverts the short message to the service node when the subscriber is roaming.
- **Get the MSC location** - This message tells the SHORT MESSAGE Center where the user 's current Mobile Switch is located.
- **Send the SHORT MESSAGE according with the actual user 's location** - This is the SHORT MESSAGE sent to the user. In case the user is roaming and available, a confirmation should be received.
- **Get Confirmation that roaming user got the SHORT MESSAGE** - This is the specific message that should trigger the SHORT MESSAGE center Agent to activate the remote retrieval notification. The message includes the full roaming information needed by the SN to take control from this point.

- **Send "Dial Short Code" message** - the local SN sends this SHORT MESSAGE to the relevant remote SN (connected to the roaming mobile network). The remote SN sends the SHORT MESSAGE to the user via the SHORT MESSAGE agent. A Special consideration should be made regarding the SHORT MESSAGE format. There is a difference between a user who gets a SHORT MESSAGE for every voice mail message including all message data (CLI, etc.), and a user who only gets "MWI" types of messages including his MBX status. When using an IS41 based network, a limitation of one SHORT MESSAGE on each network is considered.
- **In case of a corporate voicemail system** – the PBX/Voicemail that dials out to do the notification to the CPE G/W, located in the corporate environment. The CPE G/W gets the user ID (by collecting DTMF digits), and based on a DBS entry that specifies the SN location of each subscriber, sends the MWI (using Internet connection – IP message) to the home service node. The home SN continues the notification based on the above description.

Remote Retrieval of Voice Mail - Application Call Flow

The following description relates, in part, to Picture 3.

- **PIN based Login** - If the roaming network does not support CLI, the user has to Login to the SN, once he visits the network. The PIN identifies the home network ID to the SN.
- **Dial Short Code** - User dials a pre defined short code to access his home mobile network VOICEMAIL. The short code can be one of 2 options:
  (1) Global Unique short code (like "*42") that be used in the entire Global network.
  (2) A network specific short code - in this case, for each home / roaming mobile network, there is unique short code being used.
  In any case, the application handles both cases, and a look up table is maintained to enable the mapping of short codes to different mobile networks.
- **Play "Waiting prompt"** - The system plays a special prompt to the user, to indicate that "your call is now being transferred to the VOICEMAIL". This is needed specifically for new users, and to properly handle situations in which the call routing might take some time (more than 1-2 seconds). Different prompt languages are supported. The system selects the appropriate language to play based on the home node profile or the user specific profile (for cases in which one mobile network supports

several languages). Waiting prompts can be used also to play advertising messages while the user is waiting.

- **Route Call to SN** - The roaming mobile network routes the call to the local SN connected to the network. For this purpose, the network should recognise the set of possible short codes, in order to route it to the SN. The destination mobile network is selected based on the caller CLI. The user information is transferred to the destination SN via an IP message additional to the voice call transferring.
- **Call is terminated in the home VOICEMAIL** - the home SN routes the call to the VOICEMAIL via telephony trunks. While establishing the call, all relevant user data is being transferred via CLI, DN. The VOICEMAIL answers the call and the user can retrieve his messages. User is able to access his messages directly ("Linked Listen") based on specific mobile network set-up (service policy), or based on his personal preferences. In any case, the SN enables the transfer of the relevant data (using DN, CLI) and activation of the relevant DTMF commands if necessary, to enable such service.
- **User (or VOICEMAIL) Hang Up** - When the user hangs up, all Network elements should release the relevant resources trunks, IP channels, etc.
- In case of **Corporate PBX/VoiceMail** retrieval, the home SN dials to the PBX/VOICEMAIL telephones number and Login on behalf of the user. For this session, the SN keeps a user profile DBS entry.

Short Code to call-back Services

This service enables short code dials to directly access the user's callback service center. The SN gets the user request and based on its profile, transfers the call to the relevant callback service center via the PSTN or point to point dedicated line. The user continues the dialling sequence based on the callback call flow. The benefit of this service is the speed of access to callback services – the user need not enter his PIN and password for every call. The personal CLI is used to recognise the user without loss of any authentication level.

IP/TEL service to roaming subscribers

This service is an optional upgrade of the same invention topology; to enable full IP based telephony call services to roaming subscribers. The user dials a specific short code that causes the global network to route the call to his home mobile network. From this point the user dials to any destination, as he

was doing from his home mobile network. This service provides a cost-effective way to make roaming calls.

Service Node Description

The following description relates, in part, to Picture 4.

NAS - Network Application Server

This server runs the different GC applications logic. The following paragraphs describe the high level requirements from one set of applications that may be implemented according to the invention. Basically, the SN applications have the following common elements:

- ⇨ **Data stimulation processing** related to the user 's events and messages. The SN receives / monitors / sends related user events on its different networks and devices. For this purpose the low-end agents are implemented on the NAU. The NAS handles (reacts to) these events in the application level.
- ⇨ **Dynamic Call Routing** - Based on the previous events, the system routes calls both from telephony lines to telephony trunks and also between the telephone network and the IP network. For example: User calls the system by dialling a short code. Based on the user's CLI, the system routes the call the right destination network. In some cases, more than 2 parties participate in the same session. For this purpose, a 3WAY session is supported, both on the IP and the Telephony network side.
- ⇨ **Voice Functions** - The system plays voice announcements during specific events. For example: if the user asks for a resource that is not available, an appropriate "prompt" is played: "this service is not available now."
- ⇨ **User Profile** - The application considers a user profile for some of the services. It covers service level and specific service parameters. Initially, a user profile may be needed to enable PIN based Login to the roaming network, when CLI is not available.

NAU - Network Agents Unit

This unit runs several Network Agents that enable the low-level communication with the relevant network entities to monitor/control the user and its devices.

- ⇨ Short Message Agent - This is basically a Short Message package supporting the standard GSM and IS41 protocols to send Message packages to mobile users. In addition, the agent provides Message package traffic monitoring to enable triggering of events from the mobile

home network. For this purpose the Message package agent analyses Message package traffic related to the home network Message package.

- ⇨ HLR Interrogation - This agent interrogates a standard HLR on any mobile network to get the relevant user information (static and dynamic)
- ⇨ PC Agent - This agent communicates with the user PC (or any other guest PC) that use the SN services. A standard or proprietary protocol may be supported for this purpose.
- ⇨ TEL Agent - This agent handles any remote telephone calls (Mobile or Fixed Line) to enable interaction with the SN services via telephone (voice and DTMF) - like an IVR session. Call progress tone analysis is supported.

Network Messaging Unit

This sub system is mainly based on Telephony and Voice over IP switch. The system supports the following:

- ⇨ **Digital Telephony Interface** - Mainly E1/T1 is supported, but other analogue trunks may be supported as an option (for a development phase, demonstrations or maintenance purposes). MFC/R2 or any related Signalling interface is supported.
- ⇨ **SS7 Interface** - This is important to have a reliable and fast telephony signalling system supported. ISUP may be mandatory, and the Network Protocol variants should mainly comply with the Mobile Network adaptations such as those that exist today ("VOICEMAIL-ISUP" - by Nokia, CCITT, ANSI, etc.)
- ⇨ **IP Network Interface** - A standard IP permanent connection is supported to enable connection to the Internet or any other IP network.
- ⇨ **Voice over IP** - any PCM telephony (64kbs) is able to convert to standard Voice over IP stream. H.323 standard compliance may be mandatory. A proprietary implementation is applicable as additional high-end quality protocol.
- ⇨ **Network Management compliance** - The platform complies with the standard (SS7, E1/T1) Telephony Network management facilities (open/close line, etc.). In addition the evolving IP related standard is supported as well. The H.323 GateKeeper is a recommended facility to enable all IP/TEL integrated Network management features.
- ⇨ **DTMF Detection** - A special attention may be put to this issue. Many proposed services are based on user interaction with remote systems via DTMF dial over the IP network. In case that the in-band DTMF transfer may not enable the necessary detection rate, a control channel is considered for this purpose. This means that when an SN detects a DTMF on the local network side, it transfers it to the other remote SN via an IP message that causes the remote SN to re-generate the DTMF This requires DTMF detectors and generators on each SN platform.

⇨ **CPT handling** - The platform detects Call Progress Tones. The detection process may comply with different country variants. A flexible CPT table definition may be supported.

NMS - Network Management Server

This server is managing the basic OMAP capabilities.

⇨ **Maintenance** - The ongoing maintenance of the system and Network, including Monitoring, Statistics, Alarms reporting and handling, etc. Display and monitoring functions may be GUI based. A standard Network Management is used as infrastructure.

⇨ **Administration** - of the user's profile definition and updates. Billing reports of each user transaction message or call. External host computers that communicate with the NMS via standard IP based protocols (FTP) do both administration and billing.

⇨ **Network Management** - Maintain and update the Global network topology. Add new node, change node profiles (services provided, etc.). Maintain the Network **Security** aspects - the closed IP address lists, etc.

⇨ **Service Management** - The activation / deactivation of new service, the modification of the different service definition tables, etc.

⇨ **Service Creation Tool** – This SW package enables easy modification of the services call flow, w/o the need to change the SW. Modifying tables does it and using GUI based tools.

The CPE G/W description

This is basically scaled down service node platform for the corporate level voicemail.

The platform is designed for 2 sizing levels:

Large Corporate

In this case the CPE G/W runs the same SN SW like the public SN, but all the SW packages are running on one PC/NT platform. The CPE G/W has a permanent IP connection to GC Net, and telephony interfaces to the corporate PBX. The notification is done by out-dialing of the corporate Voicemail to the CPE G/W via the corporate PBX (internal call). The CPE G/W then sends IP messages to the relevant public SN (based on the user ID), that continue the notification handling like described above.

Small scale Corporate

In this case the CPE G/W handles the notification only. It may be based on PC platform WIN95 O/S with standard PC "Voice Modems" (the new modems that support voice function in addition to data communications). The voice modem is used to get the out-dial notification from the voicemail. The

retrieval is done by the home SN that dials directly to the voicemail via the PSTN and the PBX.

Appendix

Acronyms

- GSM – Global System for Mobile. A standard for mobile communications technology. Used mainly in Europe, but recently all around the world. The standard is defined in MOU documents defined by the GSM comity.
- VoiceMail – A common name for platform used for store and forward of voice messages.
- TDMA – Another standard for Mobile communications, common mainly in North America.
- Call Back Service – The type of service that provides low cost international calls using a "calling card". The user dials a common number, enter his personal identification code and then dials his destination number.
- Service Node – a platform being use as gateway between a cellular network and Global IP network backbone.
- The Global Network – An IP backbone with Service Node on each point of presence that interconnects different cellular networks and corporate local networks to enable global enhanced services.
- IP – Internet Protocol. This protocol is a common standard, and is used as the transport mechanism for the public "Internet" network, and other data networks.
- Digital Telephony Interfaces – This is the standard E1 or T1 physical interface definition, being used for interconnect telephony switches. T1 and E1 are also defined in CCITT recommendation.
- CPE G/W – This is the corporate level solution for GC service Node. It is a low cost and limited functionality platform to connect the corporate voicemail to GC Net.
- SM - Short Message – A message that a mobile subscriber gets on his mobile phone display.
- Short Message Notification - This short message is sent by voicemail system to notify the subscriber that he has a new voice mail message.

- SMSC – Short Message Service Center. This platform is part of mobile network and sends short messages to mobile subscribers.
- Short Code – this is a short number that user dials to get to a specific destination (voicemail, etc.). The mobile network operators define this number.
- CLI – Calling Line Identification – This is the caller's telephone number sent to the destination of the call.
- PERSONAL CLI – a CLI related to a specific user. If user change his mobile phone number when roaming (by renting a phone, etc.), he can change his personal CLI to the new number.
- PIN – Personal Identification Number – a combination of digits that a user dials to identify himself to a system.
- PBX Voicemail – A type of voicemail platform that is being used in the corporate environment, connected to the corporate PBX.
- PBX – Private Exchange – This is a private telephone switch that may be used (for example, by corporations) for telephone traffic handling.
- SS7 – System signalling Number 7 – this is a standard defined by CCITT and ANSI for digital transmission of signalling between public telephony switches.
- SS7 SL – SS7 Signalling Link – this is a dedicated part of a T1 or E1 link, being used to transfer the SS7 protocol messages.
- MSC – Mobile Switch Center – this is the switch that handles the telephony traffic in a Mobile Network.
- Roaming (users) – The users that use their mobile phone in a Mobile network other than the home Mobile network.
- Local SN – the service node connected to the home mobile network of the user.
- Remote SN – the service node connected to the roaming mobile network of the user.
- MBX – mailbox – this is the logical "mail box" containing the user's voice mail messages, in the voicemail system.

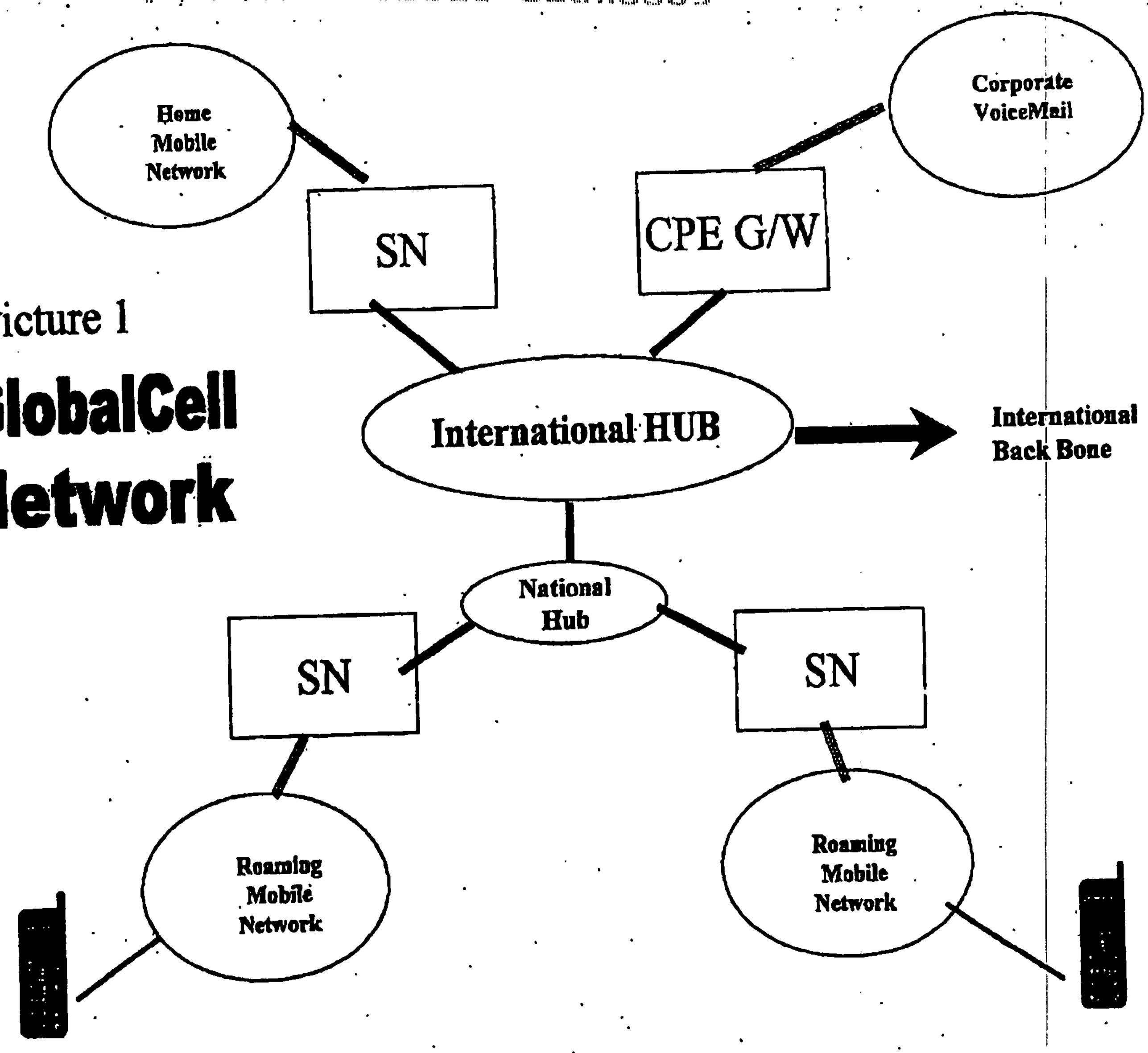
- IS41 – A standard of digital signalling in Mobile Networks like TDMA and CDMA.

- Prompt – this is a pre-recorded voice announcement being used for the vocal user interface in voicemail or other enhanced service voice based platforms.
- DN – Dialled Number – this is the number that a user dials to reach a specific location.
- DTMF – Dial Tone Multi Frequency – this is the standard tone set being used to dial by a telephone to a switch.
- DBS – Database – a software package that handles a data base – collection of data items with a specific defined structure.
- NAS– Network application Server, a subsystem of the Service Node.
- NAU– Network Agents Unit, a subsystem of the Service Node.
- NMS – Network Management Server – a subsystem of the service node.
- 3WAY – call, this is a telephone call with 3 participants.
- HLR – Interrogation - This is the Home Location Register – a server on a mobile network that holds the DBS of all mobile users. This DBS can be interrogated by other mobile network elements like the SMSC.
- IVR – Interactive Voice Response. This is a type of services that enables a user to interact with DBS applications using telephone, dialling DTMF and voice prompts.
- E1 / T1 – 2 standards for digital telephony interface to interconnect telephony switches. These standards are defined in the relevant CCITT and ETSTI standards.
- MFC/R2 – This is a standard of call establishment on E1 lines. It is defined in CCITT standards.
- ISUP – This is the CCITT definition for call establishment on top of SS7 interface.
- H.323 – This is the ITU standard for multimedia communications on top of IP networks.

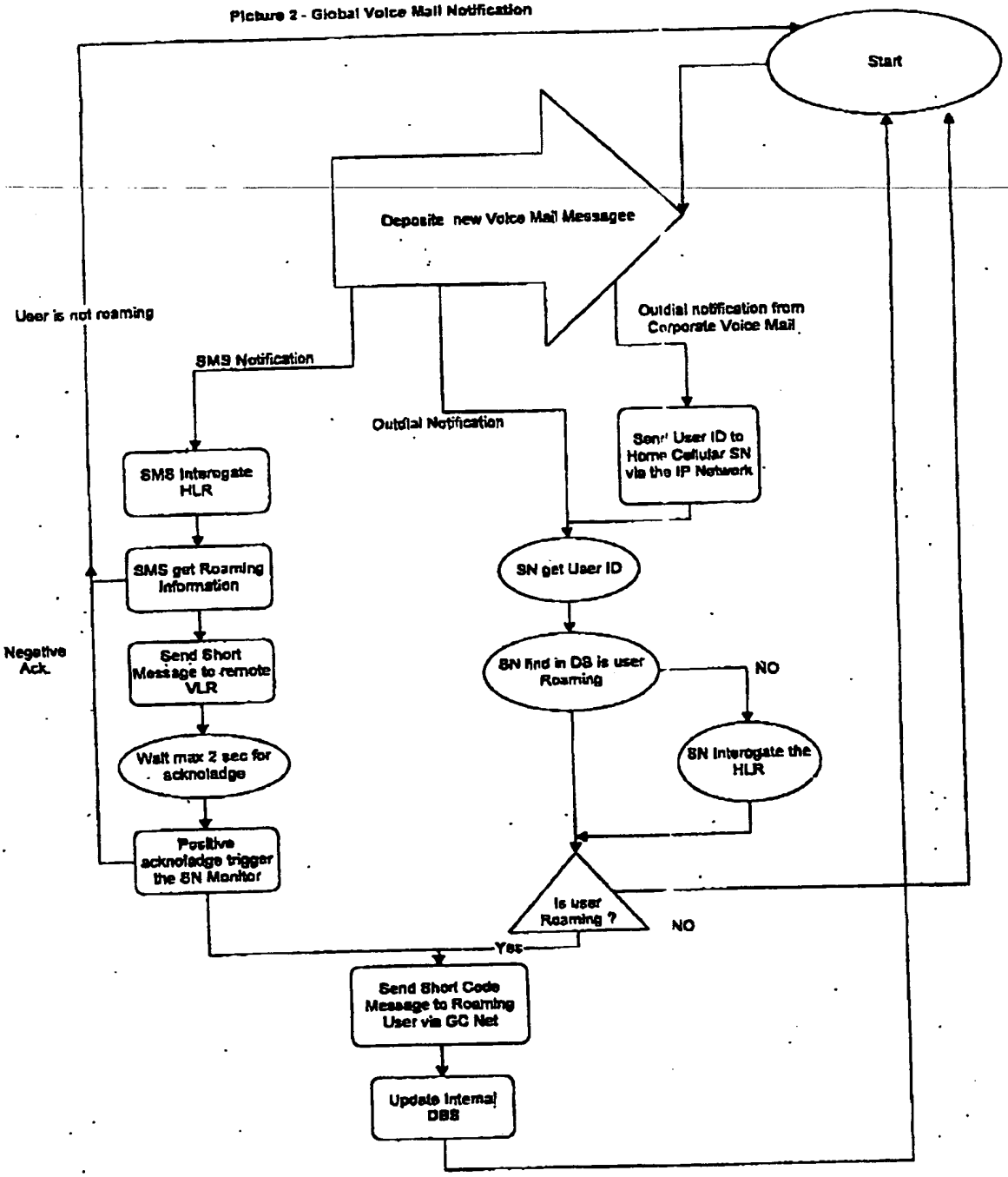
- PCM – Pulse Code Modulation – this is the standard of digital coding of voice on telephony interfaces like E1 or T1.
- GK – GateKeeper – this is a standard subsystem part of H.323 definition, to enable network and subscriber profile management for multimedia communication on top of IP network.
- CPT – Call Progress Tones – this is a set of tones that indicate to the user the state of the remote party telephone while call is being established. "Busy", "Ring back" are the main tone sets.
- SW – Software
- HW – Hardware
- PSTN – Public Switch Telephone Network. This is the public telephone network owned by the local Telephone Company in each country.

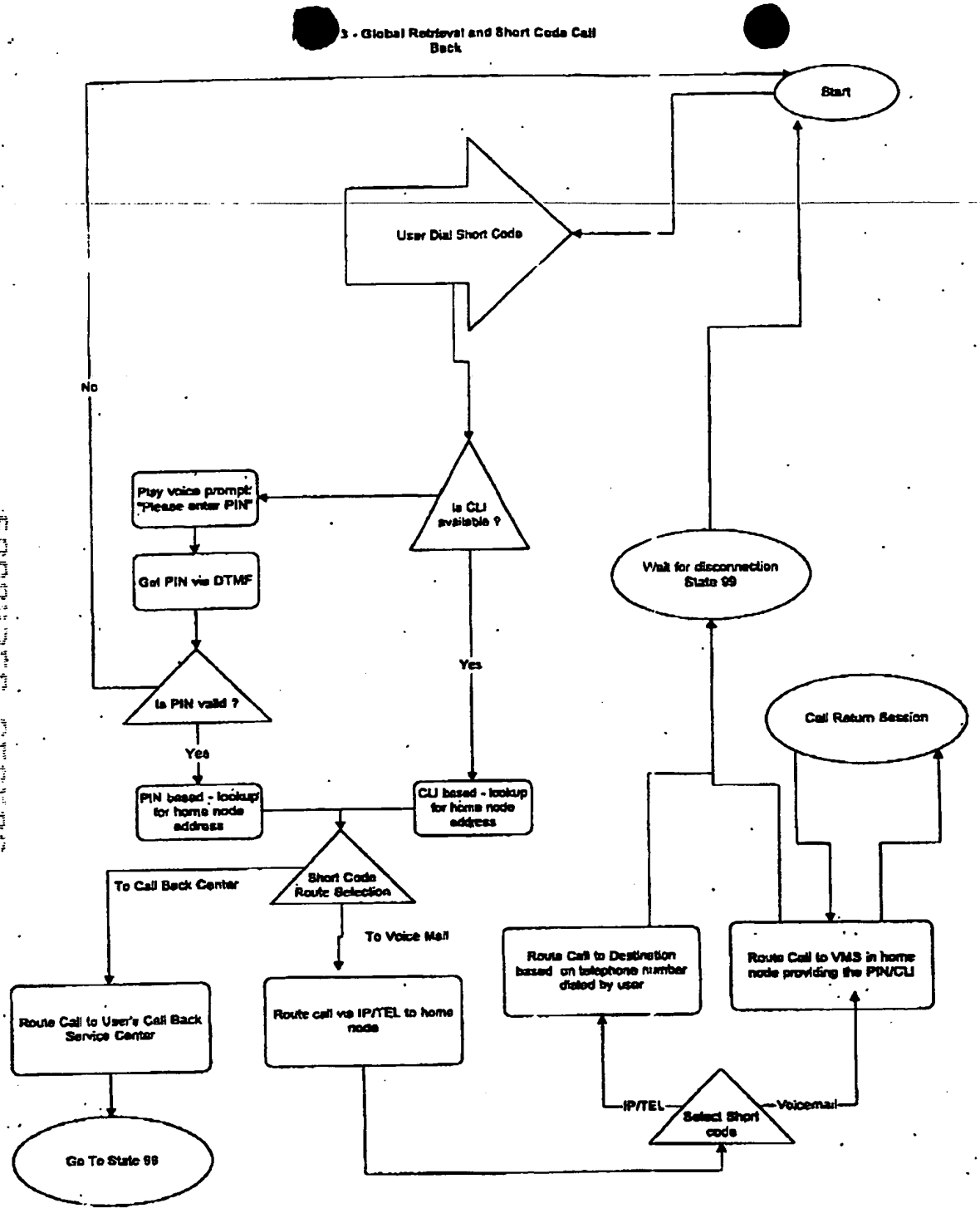
Picture 1

GlobalCell Network

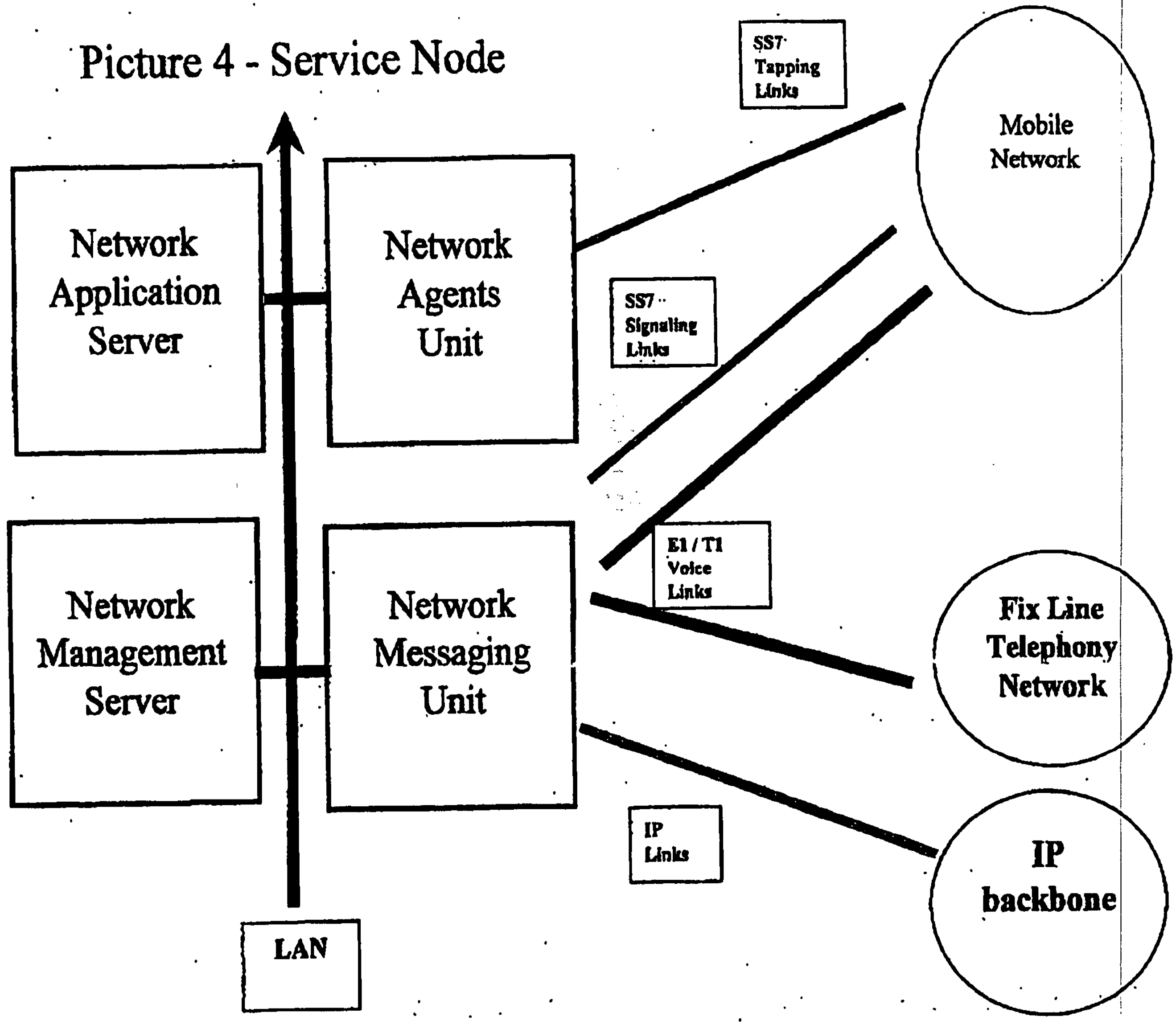


Picture 2 - Global Voice Mail Notification




3 - Global Retrieval and Short Code Call Back
Start
User Dial Short Code
No
Play voice prompt: "Please enter PIN"
Is CLI available ?
Get PIN via DTMF
Wait for disconnection State 99
Yes
Is PIN valid ?
Call Return Session
Yes
PIN based - lookup for home node address
CLI based - lookup for home node address
To Call Back Center
Short Code Route Selection
To Voice Mail
Route Call to Destination based on telephone number dialed by user
Route Call to VMS in home node providing the PIN/CLI
Route Call to User's Call Back Service Center
Route call via IP/TEL to home node
IP/TEL
Select Short code
Voicemail
Go To State 99

Picture 4 - Service Node



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